

CLAIMS

1 1. Fuel cell, which is provided with a plurality of capillary tubes, each of
2 which has an electrode and through and/or against which a fuel component flows,
3 characterized by the fact
4 -- that the capillary tubes (34) are arranged in bundles in adjacent segments
5 (35-40), with each bundle being located within a reaction chamber (68, 69),
6 -- that the electrode (41) is led out at both ends of each capillary tube,
7 -- that the electrodes (41) of the capillary tubes (34) of a segment (35-40) are
8 electrically connected at both ends at essentially the same potential, and
9 -- that at least one wall section 45 of each segment (35-40) is provided with a
10 counterelectrode (46/47) or at least partially forms the counterelectrode.

1 2. Fuel cell in accordance with Claim 1, characterized by the fact that the
2 segments (35-40) are circular segments.

1 3. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the electrodes (10) of the capillary tubes (8) of a segment (3, 5,
3 7) are connected counter to the counterelectrode (13, 15, 17) of an adjacent segment (2, 4, 6).

1 4. Fuel cell in accordance with one or more of Claims 1 and 2, characterized
2 by the fact that the electrodes (41) of all the capillary tubes (34) of a fuel cell (30) are
3 connected together at the ends.

1 5. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the connection can be preset by a switch.

1 6. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that each segment (2-7) has its own walls (13-18).

1 7. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that two spaced separating walls (19, 20; 107, 108) are formed
3 between two adjacent segments (5, 6; 100, 101).

1 8. Fuel cell in accordance with one or more of preceding Claims 1 to 5,
2 characterized by the fact that adjacent segments (35-40) have a common separating wall (45).

3 9. Fuel cell in accordance with one or more of the preceding claims,
4 characterized by the fact that separating walls (19, 20; 107, 108) are constructed without a
5 tight seal.

1 10. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a separating wall has at least one separately constructed
3 counterelectrode.

1 11. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a common separating wall (45) of two adjacent segments (35-
3 40) has a counterelectrode (46, 47) on both sides.

1 12. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a counterelectrode (46) has a support sheet (48) and that the
3 support sheet (48) is covered with a lattice-like mount (49) for a catalyst.

1 13. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a capillary tube has a lattice-like core, which is covered with a
3 catalyst and is annularly surrounded by a membrane.

1 14. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the core, the support sheet, and/or the lattice-like mount is made
3 of titanium.

1 15. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the capillary tubes (8, 34) are open at the ends and a gas has free
3 access to flow through them.

1 16. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that air flows through the capillary tubes (34) and that a pressure
3 chamber (60) is formed by a housing (81) at one end of the capillary tubes (34), which
4 terminate with their open ends in the pressure chamber (60), into which atmospheric air is
5 admitted by means of a ventilator (61).

1 17. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a common, closed-end feed line (66) for a fuel component is
3 provided between adjacent angles of segments and that the feed line (66) is provided with
4 openings (67) through which the fuel component can enter the reaction chambers (68, 69) of
5 the segments.

1 18. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that an exhaust gas line (84) is provided, which, in reaction
3 chambers (68, 69) of the segments, has openings (85) that admit a gaseous combustion
4 product and opens outside the fuel cell (30).

1 19. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the exhaust gas line (84) is a continuation of the feed line (66).

1 20. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that at least one pump (72, 73) is connected to the feed line (66) and
3 that the pump (72, 73) is installed in a pump chamber (75) of a housing (64) at the opposite
4 end of the fuel cell from the pressure chamber (60).

1 21. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the fuel component is a fuel mixture, that individual
3 components of the fuel mixture are each fed into the feed line (66) by an automatically
4 controlled pump (72, 73), and that a control system automatically controls the pumps (72, 73)

5 to provide optimum adjustment of the proportions of the individual components in the fuel
6 mixture.

1 22. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the fuel mixture contains water and methanol as its individual
3 components.

1 23. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the fuel cell (30) is designed for operation with vertically rising
3 capillary tubes (34) and with a pressure chamber (60) at the top.

1 24. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that a liquid phase emerging from the capillary tubes (34) is
3 collected in a collecting chamber (62) at the lower end.

1 25. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the liquid phase is water, which is returned to the combustion
3 process.

1 26. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the reaction chambers (68, 69) are filled with acidic methanol
3 (70, 71).

1 27. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the level of filling of the reaction chambers (68, 69) is
3 monitored with level sensors (91-93).

1 28. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by a free space (82, 83) above the acidic methanol.

1 29. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that, if the filling level is too high or too low, the combustion
3 process is stopped.

1 30. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the segments (35-40) are arranged inside a cylindrical housing
3 (31) and that the housing (31) is sealed at the axial ends by cover plates (54, 55) through
4 which the capillary tubes (34) pass.

1 31. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the cover plates (21, 22) grip the arrangement of the separating
3 walls (19, 20) of the sectors (2-7) and are likewise provided with separating webs (23, 24)
4 and that a panel (25) that encloses the capillary tubes (8) of the sector (5) below it is mounted
5 between the separating webs (23, 24).

1 32. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that electrical connections (52, 53) of the counterelectrodes (46, 47)
3 are led out through the cover plates (54, 55).

1 33. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the cover plates (54, 55) have grooves (56, 57) for holding the
3 separating walls (45) and that the grooves (56, 57) are located on the sides of the cover plates
4 (54, 55) that axially terminate the reactions chambers.

1 34. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that both ends of the separating wall (43, 44) have a projecting
3 connector (58, 58; 59, 59), which is provided with an extension [50, 51] of the support sheet
4 [48], and that the connectors pass through the cover plates (54, 55) that close the housing (31)
5 at the axial ends.

1 35. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the housing (31) is closed at each axial end by two cover plates
3 (54, 93; 55, 94).

1 36. Fuel cell in accordance with one or more of the preceding claims,
2 characterized by the fact that the housing (31) is provided with flanges (32, 33) for attaching
3 the pressure chamber housing (81) and the chambers (62, 75, 76, 77) located at the opposite
4 end of the fuel cell.